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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
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EXAMINER	
MALEK, LEILA	

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2611	

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Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)	
	09/967,208	DOGAN ET AL.	
	Examiner	Art Unit	
	Leila Malek	2611	

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on *14 February 2007*.

2a)☐ This action is **FINAL**. 2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1,3-13 and 18-25* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1,3-13 and 18-25* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *09/28/2001* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____.
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

Response to Arguments

1. Applicant's arguments, see page 11, filed on 02/14/2007, with respect to 35 USC § 101 rejection of claims 1, 3-13, and 18, have been fully considered and are persuasive. Therefore the 101 rejection has been withdrawn.

2. Applicant's argument, see page 13, with respect to the rejection(s) of claim(s) 1, 6-8, 10-12, 18, 22, and 25 under 35 USC § 102(e) has been fully considered and is persuasive. Therefore, the rejection has been withdrawn. However, upon further consideration, a new ground(s) of rejection is made (see below).

Double Patenting

3. The nonstatutory double patenting rejection is based on a judicially created doctrine grounded in public policy (a policy reflected in the statute) so as to prevent the unjustified or improper timewise extension of the "right to exclude" granted by a patent and to prevent possible harassment by multiple assignees. A nonstatutory obviousness-type double patenting rejection is appropriate where the conflicting claims are not identical, but at least one examined application claim is not patentably distinct from the reference claim(s) because the examined application claim is either anticipated by, or would have been obvious over, the reference claim(s). See, e.g., *In re Berg*, 140 F.3d 1428, 46 USPQ2d 1226 (Fed. Cir. 1998); *In re Goodman*, 11 F.3d 1046, 29 USPQ2d 2010 (Fed. Cir. 1993); *In re Longi*, 759 F.2d 887, 225 USPQ 645 (Fed. Cir. 1985); *In re Van Ornum*, 686 F.2d 937, 214 USPQ 761 (CCPA 1982); *In re Vogel*, 422 F.2d 438, 164 USPQ 619 (CCPA 1970); and *In re Thorington*, 418 F.2d 528, 163 USPQ 644 (CCPA 1969).

A timely filed terminal disclaimer in compliance with 37 CFR 1.321(c) or 1.321(d) may be used to overcome an actual or provisional rejection based on a nonstatutory double patenting ground provided the conflicting application or patent either is shown to be commonly owned with this application, or claims an invention made as a result of activities undertaken within the scope of a joint research agreement.

Effective January 1, 1994, a registered attorney or agent of record may sign a terminal disclaimer. A terminal disclaimer signed by the assignee must fully comply with 37 CFR 3.73(b).

Claims 1, 3, 5-10, 12, 13, and 22-25 are rejected on the ground of nonstatutory obviousness-type double patenting as being unpatentable over claims 1-8, 10, 11, 13, and 18-22 of U.S. Patent No. US 7,016,429 B1. Although the conflicting claims are not identical, they are not patentably distinct from each other because in claim 1 of the instant application, Applicant states "the modifying sequence being selected so that the obtained training sequence when modulated by a selected modulation format has the at least one desired property of the corresponding original ordered sequence". The "selected modulation format" can be interpreted as " a peak-to-average modulation format" as recited in claim 1 of the U.S. Patent No. US 7,016,429 B1.

Claim Rejections - 35 USC § 103

The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

4. Claims 1, 3-7, 11, 12, and 18-25 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balakrishnan et al. (hereafter, referred as Balakrishnan) (US 2003/0058926), further in view of Tarokh et al. (hereafter, referred as Tarokh) ("On the computation and reduction of the peak-to-average power ratio in multi-carrier communications", IEEE TRANSACTIONS ON COMMUNICATION, Volume: 48, Issue: 1, Jan 2000, pages 37-44).

As to claims 1 and 3, Balakrishnan discloses a method and apparatus for increasing the data rate of a communication system (see the abstract). Balakrishnan

discloses selecting a set of one or more original ordered sequences (see paragraph 0054) wherein the set of ordered sequences (i.e. training sequences have been interpreted as ordered sequences) having at least one desired property (i.e., the low normalized auto-correlation); creating a set of extended sequences (i.e., by adding a cyclic prefix to the original sequences), each based on an original ordered sequence of the set of ordered sequences by beginning with an element of the original ordered sequence of the set of ordered sequences, cyclically appending elements of the original ordered sequence of the set of ordered sequences in order to obtain a desired extended sequence length comprising at least one subsequence (see paragraph 0054). Balakrishnan further discloses that the signals at the transmitter are encoded/modulated before transmission (see Fig. 1). Balakrishnan does not expressly disclose modifying each extended sequence using a corresponding modifying sequence, such that a training sequence can be generated from any one of the modified extended sequences by beginning with a first element of a subsequence of the any one modified extended sequence and taking each element of the subsequence in order to obtain the training sequence, the modifying sequence being selected so that the obtained training sequence when modulated by a selected modulation format has the at least one desired property of the corresponding original ordered sequence. Tarokh discloses a method of developing modified wireless OFDM transmitter sequences (including training sequences) for reducing the Peak-to-Average Power Ratio in multi-carrier communication (see the Abstract and page 38, left column, lines 4-5). Tarokh also discloses that the signal has the property of low Peak-To-Average Power Ratio (See

page 37, left column, last paragraph). Tarokh further discloses that the selected OFDM sequence S(c,t) (interpreted as training sequence) has been modified by the corresponding phase shift (see Fig. 2, page 39, left column, lines 9-20, and page 43, left column, part B) wherein some phase shift sequences are shown on page 43 tables II/III (the phase shift sequences are corresponding modifying sequences). Tarokh further discloses that the modified signals when modulated by a selected modulation format (e.g. QPSK or BPSK, see page 43, left column, part B) has the at least one desired property (e.g. low PAPR) of the corresponding original ordered sequences (See page 38, left column, lines 9-15). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Balakrishnan as suggested by Tarokh in order to prevent spectral growth of the OFDM signal in the form of inter-modulation among sub-carriers and out-of-band radiation and also reduce the cost of the system (see page 37, left column, last paragraph).

As to claim 4, Balakrishnan discloses that the original ordered sequences have a cross-correlation property (see paragraph 0011). Tarokh further discloses that the modified signals when modulated by a selected modulation format (e.g. QPSK or BPSK, see page 43, left column, part B) have the at least one desired property (could be the low PAPR or any other desired property, for example low cross-correlation) of the corresponding original ordered sequences (See page 38, left column, lines 9-15). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Balakrishnan as suggested by Tarokh in order to prevent spectral growth of the OFDM signal in the form of inter-modulation among sub-carriers and out-of-band

radiation and also reduce the cost of the system (see page 37, left column, last paragraph).

As to claim 5, Balakrishnan further discloses that the one desired property comprises a function of the cross-correlation of any original sequence in the set of original sequences with any other original sequence in the set of original training sequences being below a threshold value (see paragraph 0011).

As to claim 6, Tarokh discloses that the original sequence comprises a sequence of complex numbers (see page 37, equation (1)) corresponding to phase shifts employed by the modulation format used to transmit the training sequence (See page 43, Tables II/III & page 43 left column, last paragraph and right column). It is well known in the art that modulation methods such as Quadrature Amplitude Modulation (QAM), generally define modulation constellation points arrayed around the origin in the real-imaginary (complex) plane, where each point represents a unique pairing of phase and amplitude.

As to claim 7, Tarokh further discloses that the modifying sequence comprises a sequence of complex numbers, and forming the modified extended sequence comprises multiplying each element of the extended sequence by a corresponding element of the modifying sequence (See page 38, left column, lines 9-15 and Tables II/III). It is well known in the art that modulation methods such as, Quadrature Amplitude Modulation (QAM) generally define modulation constellation points arrayed around the origin in the real-imaginary (complex) plane, where each point represents a unique pairing of phase and amplitude.

As to claim 11, Balakrishnan discloses that the original sequence comprises a sequence of binary symbols (see paragraph 0057).

As to claim 12, Tarokh further discloses (see page 43, left column, last paragraph) modifying sequence performs a binary complement operation on every other pair of elements of the extended sequence (i.e. the sequence with a cyclic prefix (see page 38, right column, line 5). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Balakrishnan as suggested by Tarokh to reduce the PAPR.

As to claims 18, Balakrishnan discloses that prefix has been added to the original sequence (see paragraph 0054); therefore the subsequence has a length greater than the original sequence.

As to claim 19, Balakrishnan discloses a data store having stored therein a plurality of ordered sequences for use in generating a training sequence (see paragraph 0043); Balakrishnan discloses that the training sequences can be selected through a random search by selecting a large number of training sequences; therefore, inherently training sequences must have been stored in a memory). Balakrishnan further discloses (see paragraph 0054) that the set of ordered sequences (i.e. training sequences have been interpreted as ordered sequences) having at least one desired property (i.e., the low normalized auto-correlation); Balakrishnan discloses all the subject matters claimed in claim 19, except for a processor to generate the training sequence by taking and modifying a number of elements of one of the plurality of ordered sequences, wherein a function of an autocorrelation of the training sequence is below a threshold value. Tarokh discloses a method of developing modified wireless OFDM transmitter

sequences (including training sequences) for reducing the Peak-to-Average Power Ratio in multi-carrier communication (see the Abstract and page 38, left column, lines 3-5). Tarokh also discloses that the signal have the property of low Peak-To-Average Power Ratio (See page 37, left column, last paragraph). Tarokh further discloses that the selected OFDM sequence S(c,t) (interpreted as training sequence) has been modified by the corresponding phase shift (see Fig. 2, page 39, left column, lines 9-20, page 43, left column, part B) wherein some phase shift sequences are shown on page 43 tables II/III (the phase shift sequences are corresponding modifying sequences). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Balakrishnan as suggested by Tarokh in order to prevent spectral growth of the OFDM signal in the form of inter-modulation among sub-carriers and out-of-band radiation and also reduce the cost of the system (see page 37, left column, last paragraph).

As to claim 20, Balakrishnan further discloses that the one desired property comprises a function of the cross-correlation of any original sequence in the set of original sequences with any other original sequence in the set of original training sequences being below a threshold value (see paragraph 0011).

As to claim 21, Balakrishnan discloses that the length of the plurality of ordered sequences is the length of the training sequence plus the index of the element of one of the plurality of training sequences (i.e. the prefix) which is the initial element of the training sequence (see paragraph 0054).

As to claims 22 and 23, Balakrishnan discloses a method and apparatus for increasing the data rate of a communication system (see the abstract). Balakrishnan discloses selecting a set of one or more original ordered sequences (see paragraph 0054) wherein the set of ordered sequences (i.e. training sequences have been interpreted as ordered sequences) having at least one desired property (i.e., the low normalized auto-correlation). Balakrishnan further discloses that the signals at the transmitter are encoded/modulated before transmission (see Fig. 1). Balakrishnan does not expressly disclose modifying each extended sequence using a corresponding modifying sequence, such that a training sequence can be generated from any one of the modified extended sequences by beginning with a first element of a subsequence of the any one modified extended sequence and taking each element of the subsequence in order to obtain the training sequence, the modifying sequence being selected so that the obtained training sequence when modulated by a selected modulation format has the at least one desired property of the corresponding original ordered sequence. Tarokh discloses a method of developing modified wireless OFDM transmitter sequences (i.e., including training sequences) for reducing the Peak-to-Average Power Ratio in multi-carrier communication (see the Abstract and page 38, left column, lines 3-5). Tarokh also discloses that the signal have the property of low Peak-To-Average Power Ratio (See page 37, left column, last paragraph). Tarokh further discloses that the selected OFDM sequence S(c,t) (interpreted as training sequence) has been modified by the corresponding phase shift (see Fig. 2, page 39, left column, lines 9-20, page 43, left column, part B) wherein some phase shift sequences are shown on page

43 tables II/III (the phase shift sequences are corresponding modifying sequences). Tarokh further discloses that the modified signals when modulated by a selected modulation format (e.g. QPSK or BPSK, see page 43, left column, part B) have the at least one desired property (e.g. low PAPR) of the corresponding original ordered sequences (See page 38, left column, lines 9-15). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Balakrishnan as suggested by Tarokh in order to prevent spectral growth of the OFDM signal in the form of inter-modulation among sub-carriers and out-of-band radiation and also reduce the cost of the system (see page 37, left column, last paragraph).

As to claim 24, Balakrishnan further discloses that the one desired property comprises a function of the cross-correlation of any original sequence in the set of original sequences with any other original sequence in the set of original training sequences being below a threshold value (see paragraph 0011).

As to claim 25, Tarokh further discloses that the modifying sequence comprises a sequence of complex numbers, and forming the modified extended sequence comprises multiplying each element of the extended sequence by a corresponding element of the modifying sequence (See page 38, left column, lines 9-15 and Tables II/III). It is well known in the art that modulation methods such as Quadrature Amplitude Modulation (QAM), generally define modulation constellation points arrayed around the origin in the real-imaginary (complex) plane, where each point represents a unique pairing of phase and amplitude.

5. Claims 8 and 10 are rejected under 35 U.S.C. 103(a) as being unpatentable over Balakrishnan and Tarokh, as suggested by Kelton et al. (hereafter, referred as Kelton) (US 6,031,865).

As to claims 8 and 10, Balakrishnan and Tarokh disclose all the subject matters claimed in claims 8 and 10, except that the modulation is π/M-MPSK modulation format. Kelton, in the same field of endeavor, discloses that a π/2-BPSK (M=2) modulation method has been used in a communication system to modulate the incoming signal (see column 3, lines 56-64). It would have been obvious to one of ordinary skill in the art at the time of invention to modify Balakrishnan and Tarokh to use the modulation method suggested by Kelton to reduce the peak-to-average power ratio.

6. Claim 13 is rejected under 35 U.S.C. 103(a) as being unpatentable over Balakrishnan and Tarokh, as suggested by Wang et al. (hereafter, referred as Wang) (US 6,289,062).

As to claim 13, Balakrishnan and Tarokh are silent in disclosing:selecting a set of original ordered sequences comprises selecting a family of gold sequences. Wang discloses a communication system for suppressing co-channel interference and reducing inter-symbol interference generated during the transfer of data packet through a selected radio frequency channel (See the abstract). Wang further discloses that the training sequence used in the system is chosen from a set of prescribed sequences (i.e., Gold sequences) so that the selected training sequence has a very low cross-correlation property (see column 5, lines 28-32). For the reasons stated above, it would

have been obvious to one of ordinary skill in the art at the time of invention to modify Balakrishnan and Tarokh as suggested by Wang.

Conclusion

Any inquiry concerning this communication or earlier communications from the examiner should be directed to Leila Malek whose telephone number is 571-272-8731. The examiner can normally be reached on 9AM-5:30PM.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Mohammad Ghayour can be reached on 571-272-3021. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

Leila Malek
Examiner
Art Unit 2611

L.M.

MOHAMMED GHAYOUR
SUPERVISORY PATENT EXAMINER